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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,340	10/14/2005	Takeo Yamaguchi	NAII124342	6307

26389 7590 06/18/2009
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EXAMINER	
DOUYETTE, KENNETH J	

ART UNIT	PAPER NUMBER
4133	

MAIL DATE	DELIVERY MODE
06/18/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/524,340	Applicant(s) YAMAGUCHI ET AL.
	Examiner KENNETH DOUYETTE	Art Unit 4133

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,16,17 and 39-72* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,16,17 and 39-72* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 February 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/11/05*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 1-2, 16-17, 39-48, 51-56, 71-72 are objected to because of the following informalities: All of the aforementioned claims recite the language “for fuel cell”. Changing to either “for a fuel cell” or “for fuel cells” would render said claims into correct English. Appropriate correction is required.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-2, 39-51 are rejected under 35 U.S.C. 102(b) as being anticipated by Cavalca et al (US 2001/0033960).

Regarding claim 1, Cavalca et al discloses an electrode (Fig 1, references 1 and 3) for fuel cell (Abstract) comprising a porous ([0099]) electron-conductive material (“electrically conductive particulate material”, [0115]) carrying a catalyst ([0099]),

- wherein a proton-conductive substance (“ionically conducting perfluorinated ionomer”, [0099]) is arranged on a surface (“interfacial regions”, Fig 2, references 4 and 5 in Fig 1, [0097], [0141]), including surfaces of pores ([0099]), of the porous electron-conductive material

(“electrically conductive particulate material”, [0115]) or in the vicinity of the surface; and

- the proton-conductive substance (“ionically conducting perfluorinated ionomer”, [0099]) is obtained by carrying out coupling (“fused”, [0099]) or polymerization of a proton-conductive substance precursor (“polymeric binder”, [0115]), a proton-conductive monomer or an equivalent thereto on the surface (“interfacial regions”, Fig 2, references 4 and 5, [0097]) or in the vicinity thereof.

Regarding claim 2, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the catalyst ([0099]) is a noble metal ([0106]) catalyst.

Regarding claim 39, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the catalyst is Pt or Pt-Ru ([0105]).

Regarding claim 40, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the porous electron-conductive material (“electrically conductive particulate material”, [0115]) is a carbon-based (“particles of carbon”, [0099]) porous electron-conductive material.

Regarding claim 41, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the carbon- based porous electron-conductive material (“electrically conductive particulate material”, [0115]) is selected

from the group consisting of carbon black ([0117]), acetylene black, graphite, carbon fiber, carbon nanotube, fullerene, activated carbon, and glass carbon.

Regarding claim 42, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the pores have the average diameter of 10 μm or less (“about” 1.05 - 1.20 μm, [0133]).

Regarding claim 43, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the proton- conductive substance (“ionically conducting perfluorinated ionomer”, [0099]) is not caused to flow out ([0101]) by a cell power generation (“power increases”, [0101]) operation from the surface of the porous electron-conductive material (“electrically conductive particulate material”, [0115]) or in the vicinity thereof.

Regarding claim 44, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses one end of the proton-conductive substance (“ionically conducting perfluorinated ionomer”, [0099]) is bound to the surface ([0141]) of the porous electron-conductive material (“electrically conductive particulate material”, [0115]) through a chemical bond (“chemical vapor deposition”, [0158]).

Regarding claim 45, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the proton- conductive substance (“ionically conducting perfluorinated ionomer”, [0099]) has a sulfonic group ([0130]) (-SO3H), a phosphoric group or a carboxyl group.

Regarding claim 46, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the proton- conductive substance

("ionically conducting perfluorinated ionomer", [0099]) is a proton-conductive polymer ([0124]) having a sulfonic group ([0130]) (-SO3H), a phosphoric group or a carboxyl group.

Regarding claim 47, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the proton- conductive substance ("ionically conducting perfluorinated ionomer", [0099]) has a hydrophobic site ([0125]), and the substance is adsorbed in a hydrophobic manner to the surface (0141]) of the porous electron-conductive material ("electrically conductive particulate material", [0115]) via the hydrophobic site ([0125]).

Regarding claim 48, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the proton- conductive substance ("ionically conducting perfluorinated ionomer", [0099]) is a proton-conductive polymer ([0125]), the polymer having a hydrophobic site ([0125]) and the polymer being adsorbed in a hydrophobic manner to the surface of the porous electron-conductive material ("electrically conductive particulate material", [0115]) via the hydrophobic site ([0125]).

Regarding claim 49, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses a fuel cell (Abstract) having an electrode (Fig 1, references 1 and 3).

Regarding claim 50, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses a solid polymer fuel cell ("PEMFC", [0102]) having an electrode (Fig 1, references 1 and 3).

Regarding claim 51, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses a direct methanol solid polymer fuel cell ([0102]) having an electrode (Fig 1, references 1 and 3).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 16-17, 52-72 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Cavalca et al (US 2001/0033960).

Regarding claim 16, Cavalca et al. discloses a method ([0174]) for producing an electrode (Fig 1, references 1 and 3) for fuel cell (Abstract), comprising the steps of:

- (a) causing ("dispersion”, [0117]) a catalyst ([0099]) to be carried on a porous ([0099]) electron-conductive material (“electrically conductive particulate material”, [0115]);
- (b) forming ("deposition”, [0158]) a proton-conductive substance (“ionically conducting perfluorinated ionomer”, [0099]) on a surface (“interfacial regions”, Fig 2, references 4 and 5, [0097], [0141]), including surfaces of pores, of the porous electron-conductive material (“electrically conductive particulate material”, [0115]) or in the vicinity thereof; and
- (c) transforming ("assembling”, [0042], [0175]) the porous electron-conductive material (“electrically conductive particulate material”, [0115]) into an assembly ([0042], [0173], [0174], [0175]).

Cavalca et al. does not explicitly disclose the steps (a, b, c) are changeable. However, the reference discloses "several methods can be used to assemble" the electrode ([0174]). It also mentions "conventional methods can be used to assemble fuel cells" ([0175]). Further, it discloses "the invention is versatile" ([0178]) and proceeds to give non-limiting examples ([0181]) beginning in [0182] through [0276]. Further still, the reference discloses the electrodes may be prefabricated ([0110]). Finally, the reference discloses that optionally, assembling the membrane electrode assembly from assembly elements can be done (0042]). Therefore the steps are changeable. In the alternative, it would have been obvious to one of ordinary skill in the

art at the time of the invention that the steps a, b, and c above can be changeable. In addition to instant claim 16, this also applies to instant claims 17, 52-56.

Regarding claim 57, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses step b) has a modification step ("can be used directly or with modification", [0110], "pre-treat", [0307]) of modifying the surface ("interfacial regions", Fig 2, references 4 and 5, [0097], [0141]) of the porous electron-conductive material ("electrically conductive particulate material", [0115]).

Regarding claim 58, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the modification step ("can be used directly or with modification", [0110]) is inserted before ("pretreat", [0307]) the proton-conductive substance ("ionically conducting perfluorinated ionomer", [0099]) is disposed on the surface ("interfacial regions", Fig 2, references 4 and 5, [0097], [0141]), including surfaces of pores, of the porous electron-conductive material ("electrically conductive particulate material", [0115]) or in the vicinity thereof.

Regarding claim 59, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the step of forming a proton-conductive substance is a step in which a methylol group (2-methyl-1-propyl alcohol, [0117]) is introduced onto the porous electron-conductive material ("electrically conductive particulate material", [0115]) and the methylol group is reacted with a proton-conductive substance precursor ("polymeric binder", [0115]), to form the proton-conductive substance ("ionically conducting perfluorinated ionomer", [0099]).

Regarding claim 60, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the catalyst ([0099]) is a noble metal ([0106]) catalyst.

Regarding claim 61, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the catalyst is Pt or Pt-Ru ([0105]).

Regarding claim 62, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the porous electron-conductive material (“electrically conductive particulate material”, [0115]) is a carbon-based (“particles of carbon”, [0099]) porous electron-conductive material.

Regarding claim 63, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the carbon- based porous electron-conductive material (“electrically conductive particulate material”, [0115]) is selected from the group consisting of <u>carbon black</u> ([0117]), acetylene black, graphite, carbon fiber, carbon nanotube, fullerene, activated carbon, and glass carbon.

Regarding claim 64, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the pores have the average diameter of 10 μm or less (1.20 μm, [0133]).

Regarding claim 65, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the proton- conductive substance (“ionically conducting perfluorinated ionomer”, [0099]) is not caused to flow out ([0101]) by a cell power generation (“power increases”, [0101]) operation from the surface of the

porous electron-conductive material (“electrically conductive particulate material”, [0115]) or in the vicinity thereof.

Regarding claim 66, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses one end of the proton-conductive substance (“ionically conducting perfluorinated ionomer”, [0099]) is bound to the surface ([0141]) of the porous electron-conductive material (“electrically conductive particulate material”, [0115]) through a chemical bond (“chemical vapor deposition”, [0158]).

Regarding claim 67, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the proton- conductive substance (“ionically conducting perfluorinated ionomer”, [0099]) has a sulfonic group (-SO3H) ([0183]), a phosphoric group or a carboxyl group.

Regarding claim 68, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the proton- conductive substance (“ionically conducting perfluorinated ionomer”, [0099]) is a proton-conductive polymer ([0124]) having a sulfonic group ([0130]) (-SO3H), a phosphoric group or a carboxyl group.

Regarding claim 69, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the proton- conductive substance (“ionically conducting perfluorinated ionomer”, [0099]) has a hydrophobic site ([0125]), and the substance is adsorbed in a hydrophobic manner to the surface (0141]) of the porous electron-conductive material (“electrically conductive particulate material”, [0115]) via the hydrophobic site ([0125]).

Regarding claim 70, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the proton- conductive substance ("ionically conducting perfluorinated ionomer", [0099]) is a proton-conductive polymer ([0125]), the polymer having a hydrophobic site ([0125]) and the polymer being adsorbed in a hydrophobic manner to the surface of the porous electron-conductive material ("electrically conductive particulate material", [0115]) via the hydrophobic site ([0125]).

Regarding claim 71, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses a method ([0174]) for producing a fuel cell (Abstract), comprising the steps of:

- using electrodes (Fig 1, references 1 and 3) for fuel cell (Abstract) obtained with a method according to Claim 16 as a cathode and/or an 'anode (Fig 1, references 1 and 3, "first" and "second" electrodes respectively); and
- arranging the cathode and/or the anode (Fig 1, references 1 and 3, "first" and "second" electrodes respectively) so as to sandwich (Fig 1, [0097]) an electrolyte (Fig 1, reference 2) therebetween

Regarding claim 72, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the assembly (Fig 1) is a catalyst layer ([0097]) formed on one or both of the electrodes (Fig 1, references 1 and 3) for fuel cell (Abstract).

Regarding claim 17, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the method ([0174]) for producing an electrode for fuel cell (Abstract), comprising the steps of:

- (a) causing ("dispersion", [0117]) a catalyst ([0099]) to be carried on a porous ([0099]) electron-conductive material ("electrically conductive particulate material", [0115]);
- (b) forming ("deposition", [0158]) a proton-conductive substance ("ionically conducting perfluorinated ionomer", [0099]) on a surface ("interfacial regions", Fig 2, references 4 and 5, [0097], [0141]), including surfaces of pores, of the porous electron-conductive material ("electrically conductive particulate material", [0115]) or in the vicinity thereof; and
- (c) transforming ("assembling", [0042], [0175]) the obtained porous electron-conductive material ("electrically conductive particulate material", [0115]) into an assembly ([0042], [0173], [0174], [0175])

Regarding claim 52, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the method ([0174]) for producing an electrode for fuel cell (Abstract), comprising the steps of

- (a) forming ("deposition", [0158]) a proton-conductive substance ("ionically conducting perfluorinated ionomer", [0099]) on a surface ("interfacial regions", Fig 2, references 4 and 5, [0097], [0141]), including surfaces of pores, of the porous electron-conductive material ("electrically

conductive particulate material", [0115]) or in the vicinity thereof; thereafter,

- (b) transforming ("assembling", [0042], [0175]) the porous electron-conductive material ("electrically conductive particulate material", [0115]) into an assembly ([0042], [0173], [0174], [0175]), and then
- (c) causing ("dispersion", [0117]) a catalyst ([0099]) to be carried on a porous ([0099]) electron-conductive material ("electrically conductive particulate material", [0115]);

Regarding claim 53, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the method ([0174]) for producing an electrode for fuel cell (Abstract), comprising the steps of:

- (a) forming ("deposition", [0158]) a proton-conductive substance ("ionically conducting perfluorinated ionomer", [0099]) on a surface ("interfacial regions", Fig 2, references 4 and 5, [0097], [0141]), including surfaces of pores, of the porous electron-conductive material ("electrically conductive particulate material", [0115]) or in the vicinity thereof; thereafter,
- (b) causing ("dispersion", [0117]) a catalyst ([0099]) to be carried on a porous ([0099]) electron-conductive material ("electrically conductive particulate material", [0115]); and then

- (c) transforming ("assembling”, [0042], [0175]) the porous electron-conductive material (“electrically conductive particulate material”, [0115]) into an assembly ([0042], [0173], [0174], [0175]),

Regarding claim 54, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the method ([0174]) for producing an electrode for fuel cell (Abstract), comprising the steps of:

- (a) forming ("deposition”, [0158]) a proton-conductive substance (“ionically conducting perfluorinated ionomer”, [0099]) on a surface (“interfacial regions”, Fig 2, references 4 and 5, [0097], [0141]), including surfaces of pores, of the porous electron-conductive material (“electrically conductive particulate material”, [0115]) or in the vicinity thereof; thereafter,
- (b) transforming ("assembling”, [0042], [0175]) the porous electron-conductive material (“electrically conductive particulate material”, [0115]) into an assembly ([0042], [0173], [0174], [0175]), and then
- (c) causing ("dispersion”, [0117]) a catalyst ([0099]) to be carried on a porous ([0099]) electron-conductive material (“electrically conductive particulate material”, [0115]).

Regarding claim 55, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the method ([0174]) for producing an electrode for fuel cell (Abstract), comprising the steps of:

- (a) transforming ("assembling”, [0042], [0175]) the porous electron-conductive material (“electrically conductive particulate material”, [0115]) into an assembly ([0042], [0173], [0174], [0175]); thereafter,
- (b) causing ("dispersion”, [0117]) a catalyst ([0099]) to be carried on a porous ([0099]) electron-conductive material (“electrically conductive particulate material”, [0115]); and then
- (c) forming ("deposition”, [0158]) a proton-conductive substance (“ionically conducting perfluorinated ionomer”, [0099]) on a surface (“interfacial regions”, Fig 2, references 4 and 5, [0097], [0141]), including surfaces of pores, of the porous electron-conductive material (“electrically conductive particulate material”, [0115]) or in the vicinity thereof

Regarding claim 56, Cavalca et al. discloses all of the claim limitations as set forth above. Additionally, the reference discloses the method ([0174]) for producing an electrode for fuel cell (Abstract), comprising the steps of:

- (c) transforming ("assembling”, [0042], [0175]) the porous electron-conductive material (“electrically conductive particulate material”, [0115]) into an assembly ([0042], [0173], [0174], [0175]); thereafter,
- (b) causing ("dispersion”, [0117]) a catalyst ([0099]) to be carried on a porous ([0099]) electron-conductive material (“electrically conductive particulate material”, [0115]); and then

- (a) forming ("deposition”, [0158]) a proton-conductive substance (“ionically conducting perfluorinated ionomer”, [0099]) on a surface (“interfacial regions”, Fig 2, references 4 and 5, [0097], [0141]), including surfaces of pores, of the porous electron-conductive material (“electrically conductive particulate material”, [0115]) or in the vicinity thereof.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to KENNETH DOUYETTE whose telephone number is (571)270-1212. The examiner can normally be reached on Monday - Thursday 7:30am - 5pm, every other Friday 7:30am - 4pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Basia Ridley can be reached on (571) 272-1453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. D./
Examiner, Art Unit 4133

/Barbara L. Gilliam/
Supervisory Patent Examiner, Art Unit 4133